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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/721,948	Applicant(s) LOCE ET AL.	
	Examiner Jeffrey S. Smith	Art Unit 2635	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 25 November 2003.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-45 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-45 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 11/06.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Drawings

The petition to accept the color drawings is currently being reviewed by technology center 2600. A decision has not yet been made.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-45 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In independent claims 1, 12, 13, 18 and 21-23, the abbreviation "GCR" should be initially defined as "gray component replacement (GCR)."

Claim 1 recites "illuminant-neutral GCR." On page 18 of the specification, "illuminant" is defined as incident luminous energy specified by its relative spectral power distribution. On page 19 of the specification, "neutral" is defined as a quality of a color that describes its lack of a predominant hue, such as black for example. Therefore, one of skill in this art would presume that the claimed illuminant-neutral GCR is black, because, regardless of the spectral power distribution of the incident luminous energy (illuminant), the color black lacks a predominant hue (it is neutral). However, pages 41-48 of the specification define illuminant-neutral GCR as something else. For example, page 43 expresses it as "a colorant that is non-neutral under white light and

neutral under the target illuminant." An example of an illuminant-neutral GCR is given in the specification as magenta. This term should be defined and clarified in the claim to be consistent with pages 41-48 of the specification rather than pages 18-19 of the specification, so that a person of ordinary skill in the art can ascertain the meaning and scope of the claim. See MPEP 2173.03.

All independent claims 1, 12, 13, 18, and 21-23 recite "illuminant-neutral GCR" and therefore should be amended to clarify and define this term in the claims.

Claims 1, 12, 13, 18, and 21-23 recite "to alter to the" which should be changed to "to alter the."

Also in claim 1, line 11, "the source image" in the singular is indefinite because line 1 recites "a plurality of source images."

Throughout claims 1-45, applicant uses "narrow-band" and "narrowband" interchangeably. One of these words should be used consistently throughout claims 1-45 to provide clarity.

In claim 4, "the narrow-band illuminant(s)" lacks antecedent basis for multiple illuminants because claim 1 recites "a narrow-band illuminant." Also in claim 4, "the source image" in the singular is indefinite. The term "the colorants" lacks antecedent basis.

In claim 7, "rendered as pattern" should be "rendered as a pattern." Also, "each of which narrowband colorants" should be "each of said narrowband colorants."

In claims 8 and 9, "the selected narrowband colorant" lacks antecedent basis, because no colorant has been selected.

In claim 12, “at least one the encoded source images” should be “at least one of the encoded source images.”

Claim 13 recites “plural source images” in line 1, “plurality of source images” in lines 3 and 4, “one or more source images” in lines 5-6 and “each source image” in line 7, which is indefinite because the claim is unclear as to whether the plural source images are different from the plurality of source images, the one or more source images, and each source image.

In claim 14, “the narrow-band illuminant(s)” lacks antecedent basis. Also in claim 14, “the source image” in the singular is indefinite, because claim 13 recites “plural source images.” The term “the colorants” lacks antecedent basis.

In claim 17, “the printer include” is grammatically incorrect.

In claim 19, “the illuminant is a narrowband illuminant is selected from the group” is grammatically incorrect.

In claim 20, “a defined field of illumination of a narrowband illuminant” should be “a defined field of illumination by the selected narrowband illuminant” to reflect the antecedent basis of the illuminant selected in claim 19.

In claim 21, “so as to increase confusion” is indefinite because this is a subjective term that reflects a state of mind. Also, “the source image” in the singular is indefinite in view of the antecedent “a plurality of source images.”

In claim 22, the phrase “recovery under illumination by a multiband illuminant” is inconsistent with “recovering...by subjecting the rendered composite image to...a narrowband illuminant.” Also, “the source image” in the singular is indefinite.

In claim 23, "the first and second source images" lacks antecedent basis. Also, "the encoded source image" in lines 13-14 is inconsistent with "encode the source images" in line 3.

In claim 25, "the colorants" lacks antecedent basis. Also, "the narrow-band illuminant(s)" is inconsistent with "an illuminant" in claim 23.

In claim 27, "the separation image planes" lacks antecedent basis.

In claim 28, the phrase "the spectral multiplexer is operable for is spectrally multiplexing" is grammatically incorrect.

In claim 31, the terms "when necessary" are unclear. When would converting be necessary? Also, "the first (polychromatic) source image" should be "the polychromatic source image" to be consistent with lines 2-3. The term "a monochromatic version of the second source image" is unclear as to whether this is identical to "a respective monochromatic image" in line 7 or something else.

In claim 39, which depends from 23, "the dynamic range determination" lacks antecedent basis.

In claim 40, "the source image" is indefinite.

In claim 41, "the image recording device" lacks antecedent basis.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9, 11-16, 18, 21-31, 33-45 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,891,959 issued to Reed et al. ("Reed").

For claim 1, Reed discloses a method of processing a plurality of source images, comprising the steps of: encoding the plurality of source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image (see Figs. 3, 8, 12a; column 3 line 38-53; column 6 lines 9-63; An image 10 is embedded in another image 12, which is a background image, with modifying Bk channel information of image 12 and a corresponding negative amount in CMY channels. The Bk colorant used to encode image 10 is the illuminant-neutral GCR that is employed to alter the composition of the source images); rendering the composite image on a substrate by use of a plurality of colorants (see Fig. 2, column 3 lines 38-53, column 4 lines 17-41; Both images 10 and 12 are combined and rendered on media 12, which is a piece of paper); and recovering at least one of the encoded source images from the rendered composite image, such that the recovered source image is made distinguishable, by subjecting the rendered composite image to a narrow-band illuminant that is selected to reveal the source image (see Fig. 12a and column 6, lines 9-63; Image 10 is distinguishable from image 10 under an IR illumination, which has band narrower than the whole spectral ranges covered by the reflected spectrum of the combined spectra of Y, M, C, K colorant).

For claim 2, Reed discloses that the recovered source image is made visually detectable by an observer (see column 8, lines 36-44).

For claim 3, Reed discloses that the source image encoding step further comprises the step of mapping values representative of each source image pixel to a corresponding pixel value in a respective colorant image plane (see column 3, line 54 to column 4, line 42).

For claim 4, Reed discloses that the mapped values are determined according to at least one of the following: (a) the trichromacy of human visual response to colorant/illuminant interaction; (b) the spectral characteristics of the colorants selected for rendering the composite image, and (c) the spectral characteristics of the narrow-band illuminant(s) used for recovering the source image (see column 3, line 54 to column 4, line 42; The mapped values are determined in YMCK. This at least meets the above-recited items (a) and (b)).

For claim 5, Reed discloses that the source image encoding step further comprises the steps of: converting at least one source image to a monochromatic separation image; and mapping the monochromatic separation image to a corresponding colorant image plane in the composite image (see column 3, line 54 to column 4, line 42; Details of converting image 10 to a black channel image 10' for the mapping is discussed. Conversion to Y, M, and C channel images for the same purpose is also mentioned).

For claim 6, Reed discloses that a narrowband colorant is assigned to a respective colorant image plane of the composite image, and the mapped values in the

respective colorant image planes represent the relative amounts of the narrowband colorant to be deposited in the rendered composite image (column 3, line 54 to column 4, line 42; As discussed above, each Y, M, C, K is a narrow band colorant. The mapped (modified) values of YMCK are related to image 10').

For claim 7, Reed discloses that the composite image is rendered as pattern of deposited narrowband colorants, each of which narrowband colorants exhibiting a predefined spectral reflectance characteristic (see column 3, line 54 to column 4, line 42; A composite image is carried on media 12 with rendering each YMCK image channel (pattern) on the media. As discussed above, each Y, M, C, K colorant has predefined spectral reflectance characteristic. This is also well known in the art. For example, Y colorant reflects a white light mainly in the spectral range representing a yellow color. Otherwise, we do not call it yellow colorant).

For claim 8, Reed discloses that the selected narrowband colorant exhibits a predefined narrowband absorption characteristic (see column 3, line 54 to column 4, line 42; Y, M, C colorants are selected for data embedding. Each Y, M, C has an absorption band narrower than the whole visible spectral ranges. Therefore, each exhibits a predefined narrow band absorption characteristic).

For claim 9, Reed discloses that the selected narrowband colorant is selected from the group of cyan, magenta, and yellow colorants (see column 3, line 54 to column 4, line 42).

For claim 11, Reed discloses that the rendered composite image is rendered using a digital color electrophotographic printer (see Fig. 15).

For claim 12, Reed discloses a spectral multiplexer for receiving image data representative of plural source images and for processing the image data to encode the source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image and for providing a composite image data signal (see column 12 lines 21-33); an image rendering device which is responsive to the spectral multiplexer for receiving the composite image data signal and for rendering the composite image on a substrate (column 12, lines 21-33; printer 150 in column 10, lines 42-64; The passage in column 4, lines 40-41 also inherently teaches an image rendering device to print the composite image on media 12); and a demultiplexer for subjecting the rendered composite image on the substrate to illumination by a narrowband illuminant having a selected spectral power distribution, such that at least one the encoded source images is made detectable (see column 12 lines 21-33).

For claim 13, Reed discloses a spectral multiplexer for receiving image data representative of a plurality of source images and for processing the image data to encode the plurality of source images into a composite image data signal, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image and wherein values representative of each source image pixel are mapped to a corresponding pixel value in a respective colorant image plane (see Figs. 3, 8, 12a; column 3 line 38-53; column 6 lines 9-63; An image 10 is embedded in another image 12, which is a background image, with modifying Bk channel information of image 12 and a corresponding negative amount in

CMY channels. The Bk colorant used to encode image 10 is the illuminant-neutral GCR that is employed to alter the composition of the source images).

For claim 14, Reed discloses that the mapped values are determined according to at least one of the following: (a) the trichromacy of human visual response to colorant/illuminant interaction; (b) the spectral characteristics of the colorants selected for rendering the composite image, and (c) the spectral characteristics of the narrow-band illuminant(s) used for recovering the source image (column 3, line 54 to column 4, line 42; The mapped values are determined in YMCK. This at least meets the above-recited items (a) and (b)).

For claim 15, Reed discloses an image recording device for receiving the composite image in the form of a composite image data file and for rendering the corresponding composite image as a rendered composite image in a plurality of narrowband colorants on a substrate (see Fig. 15).

For claim 16, Reed discloses that the image recording device is provided in the form of a printer for printing the composite image on a substrate (column 12, lines 21-33; printer 150 in column 10, lines 42-64).

For claim 18, Reed discloses a demultiplexer for subjecting the rendered composite image to illumination by an illuminant having a selected spectral power distribution such that at least one of the encoded source images is made distinguishable (see Figs. 2 and 12a).

For claim 21, Reed discloses a method for processing a plurality of source images, comprising the steps of: encoding the plurality of source images in a composite

image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image, and wherein a gray component replacement fraction in the illuminant-neutral GCR is spatially modulated, so as to increase confusion; rendering the composite image on a substrate by use of a plurality of colorants; and recovering at least one of the encoded source images from the rendered composite image, such that the recovered source image is made distinguishable, by subjecting the rendered composite image to a narrow-band illuminant that is selected to reveal the source image (see Figs. 3, 8, 12a; column 3 line 38-53; column 6 lines 9-63; An image 10 is embedded in another image 12, which is a background image, with modifying Bk channel information of image 12 and a corresponding negative amount in CMY channels. The Bk colorant used to encode image 10 is the illuminant-neutral GCR that is employed to alter the composition of the source images. The narrow-band IR illuminant reveals the encoded source image).

For claim 22, Reed discloses a method for processing a plurality of source images, comprising the steps of: encoding the plurality of source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image, and wherein a gray component replacement fraction in the illuminant-neutral GCR is implemented to encode an additional, low-resolution source image intended for recovery under illumination by a multiband illuminant; rendering the composite image on a substrate by use of a plurality of colorants; and recovering at least one of the encoded source images from the rendered composite image, such that the recovered source image is

made distinguishable, by subjecting the rendered composite image to at least one of: (a) a multiband illuminant and (b) a narrowband illuminant that is selected to reveal the source image (see Figs. 3, 8, 12a; column 3 line 38-53; column 6 lines 9-63; An image 10 is embedded in another image 12, which is a background image, with modifying Bk channel information of image 12 and a corresponding negative amount in CMY channels. The Bk colorant used to encode image 10 is the illuminant-neutral GCR that is employed to alter the composition of the source images. The narrow-band IR illuminant reveals the encoded source image).

For claim 23, Reed discloses a spectral multiplexer for receiving image data representative of plural source images and for processing the image data to encode the source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image and for providing a composite image data signal (see Figs. 3, 8, 12a; column 3 line 38-53; column 6 lines 9-63; An image 10 is embedded in another image 12, which is a background image, with modifying Bk channel information of image 12 and a corresponding negative amount in CMY channels. The Bk colorant used to encode image 10 is the illuminant-neutral GCR that is employed to alter the composition of the source images); an image rendering device which is responsive to the spectral multiplexer for receiving the composite image data signal and for rendering the composite image on a substrate; and a spectral demultiplexer for subjecting the rendered composite image on the substrate to illumination by an illuminant having a predefined spectral power distribution for which at least one of the first and second

source images was encoded, such that a recovered source image derived from the encoded source image is recovered when the rendered composite image is subjected to the illuminant (see figures 2 and 12a).

For claim 24, Reed discloses that the spectral multiplexer is operable for mapping values representative of each source image pixel to a corresponding pixel value in a respective colorant image plane (see column 3, line 54 to column 4, line 42).

For claim 25, Reed discloses that the mapped values are determined according to at least one of the following: (a) the trichromacy of human visual response to colorant/illuminant interaction; (b) the spectral characteristics of the colorants selected for rendering the composite image, and (c) the spectral characteristics of the narrow-band illuminant(s) used for recovering the source image (see column 3, line 54 to column 4, line 42; The mapped values are determined in YMCK. This at least meets the above-recited items (a) and (b)).

For claim 26, Reed discloses that the spectral multiplexer is operable for spectrally encoding a polychromatic source image by mapping pixel values representative of plural separation images to a corresponding pixel value in one or more of a plurality of colorant image planes (see figure 2).

For claim 27, Reed discloses that the separation images define the polychromatic source image according to the separation image planes, and wherein the composite image is defined in a spectrally multiplexed (SM) image plane having patterns of pixels, whereby at each location in the SM image plane, a pixel value representing one or more spectral components may be present, and wherein the pixel

value patterns are determined according to the gray level of the corresponding pixels in one or more of the separation image planes (see figure 2).

For claim 28, Reed discloses that the spectral multiplexer is operable for is spectrally multiplexing to the SM image plane wherein certain pixels includes color values representative of color separation image data from more than one source image plane (see column 3 line 54-column 4 lin 41).

For claim 29, Reed discloses that the spectral multiplexer is operable for converting the polychromatic source image to an array of respective monochromatic separation images, each of which being mapped to a corresponding colorant image plane in the composite image, and the plurality of separation images being mapped to a corresponding plurality of colorant image planes in the composite image (see column 4 lines 17-41).

For claim 30, Reed discloses that the spectral multiplexer is operable for assigning each colorant to a respective colorant image plane of the composite image, and the colorant values in the respective colorant image planes represent the relative amounts of colorant to be deposited in the rendered composite image (see column 4 lines 17-41).

For claim 31, Reed discloses that the spectral multiplexer is operable for receiving image data representative of a polychromatic source image, and converting, when necessary, the array of image data representative of the polychromatic source image to respective separation images, and wherein the spectral multiplexer is operable for receiving second image data which is representative of a second source image, and

for converting, when necessary, the second source data to provide a respective monochromatic image, wherein the separation images and the monochromatic image are mapped to corresponding ones of plural colorant image planes in the composite image, and wherein the resulting composite image incorporates spectrally encoded information representing both the first (polychromatic) source image and a monochromatic version of the second source image (see column 4 lines 17-41).

For claim 33 Reed discloses that the spectral demultiplexer includes a controller and an illuminant source responsive to illuminant source control signals provided by the controller, and wherein the illuminant source includes one or more light sources for providing desired spectral power distributions in plural selectable bands of radiant energy.

For claim 34, Reed discloses that the selectable bands correspond to the long, medium, and short (LMS) wavelength bands of the light spectrum (see column 6 lines 11-23).

For claim 35, Reed discloses that the image rendering device employs at least one selected colorant selected for its narrowband absorbing properties so as to appear dark when subjected to a first illuminant having a spectral power distribution that lies substantially within the spectral absorption band of the selected colorant, and to appear light when subjected to a second, differing illuminant having a spectral power distribution that lies substantially outside of the spectral absorption band of the selected colorant (see column 6 lines 11-23).

For claim 36, Reed discloses that the spectral multiplexer is provided in the form of a computer for receiving image data files representative of a plurality of source images and for encoding the image data files as a composite image data file (see figures 12a and 12b).

For claim 37, Reed discloses that the spectral multiplexer is operable to perform a dynamic range determination so as to provide a maximum usable contrast in a recovered normalized image (see figure 2).

For claim 38, Reed discloses that the spectral multiplexer is operable to perform a dynamic range determination by permuting the allocation of the source image to differing monochromatic separations, in an image-dependent fashion, so as to restrict the gamut of the source image only to the extent required by the source image (see figure 2).

For claim 39, Reed discloses that the dynamic range determination includes limiting the gamut of the source image (see figure 2).

For claim 40, Reed discloses that the spectral multiplexer is operable to perform the addition of image masking signals to the source image (see figure 2).

For claim 41, Reed discloses that the image recording device is provided in the form of a printer for printing the composite image on a substrate (see figure 15).

For claim 42, Reed discloses that the printer includes one or more of cyan, magenta, yellow, and black colorants selected for their apparent darkness when exposed to complementary illuminants (see columns 3 and 4).

For claim 43, Reed discloses at least one of a composite image file storage device and a composite image file transmission device (see figures 12a and 12b).

For claim 44, Reed discloses a gray component replacement fraction in the illuminant-neutral GCR is implemented to encode one of the first and second source images intended for recovery under illumination by a multiband illuminant; and wherein the spectral demultiplexer is operable for subjecting the rendered composite image to at least one of: (a) a first illuminant that is selected to reveal a selected one of the first and second source images and (b) a second illuminant that is selected to reveal the remaining one of the first and second source images (the normal and IR lights are the first and second illuminants).

For claim 45, Reed discloses that the first illuminant is a narrowband illuminant (IR is a narrowband illuminant) and the second illuminant is at least one of a multiband illuminant and a wideband illuminant (normal light is a wideband illuminant).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3-30, 32-35, 41-42 and 44-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,576,528 issued to Chew et al. ("Chew") in view of U.S. Patent No. 6,972,866 issued to Bares et al. ("Bares").

For claim 1, Chew discloses a method of processing a plurality of source images, comprising the steps of: encoding the plurality of source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image (see figure 3 and column 6 lines 10-27); rendering the composite image on a substrate by use of a plurality of colorants (see figure 3); and recovering at least one of the encoded source images from the rendered composite image, such that the recovered source image is made distinguishable, by subjecting the rendered composite image to a narrow-band illuminant that is selected to reveal the source image (see figure 4).

Chew discloses that the CMY colors can be replaced by black, which is *ipso facto* gray component replacement, because the color components are replaced by the gray component. Chew does not explicitly disclose that black ink is an illuminant-neutral GCR.

Bares discloses that black ink is an illuminant-neutral GCR (see column 5 lines 10-20).

It would have been obvious to one of ordinary skill in the art at the time of the invention to recognize that the black ink in the method of Chew can be used as illuminant neutral GCR because Bares teaches that this reduces the use of CMY colorants at column 2 lines 29-30.

Regarding claim 3, Chew discloses the source image encoding step further comprises the step of mapping values representative of each source image pixel to a

corresponding pixel value in a respective colorant image plane (col. 5, line 66 - col. 6, line 28; col. 8, lines 24-40, Chew teaches a control means instructing the printer where to print the respective colorants for each constituent barcode and producing a map of the respective color combinations).

Regarding claim 4, Chew discloses the mapped values are determined according to at least one of the following: (a) the trichromacy of human visual response to colorant/illuminant interaction; (b) the spectral characteristics of the colorants selected for rendering the composite image, and (c) the spectral characteristics of the narrow-band illuminant(s) used for recovering the source image (col. 4, lines 64 - col. 5, line 45, Chew teaches the invention implements the CMY color model for generating the aggregate barcode and the RGB color model for resolving the aggregate barcode into the three constituent barcodes).

Regarding claim 5, Chew discloses the source image encoding step further comprises the steps of: converting at least one source image to a monochromatic separation image (col. 5, lines 60-65, Chew teaches barcodes are commonly represented by white and black but in the invention each barcode is printed using cyan, magenta and yellow respectively); and mapping the monochromatic separation image to a corresponding colorant image plane in the composite image (col. 5, line 66 - col. 6, line 35, Chew teaches the print controller instructs the printer where to deposit the color components in order to form each of the barcodes).

Regarding claim 6, Chew further discloses a narrow band colorant is assigned to a respective colorant image plane of the composite image (col. 5, line 66 - col. 6, line

28; col. 8, lines 24-40, Chew teaches a control means instructing the printer where to print the respective colorants for each constituent barcode and producing a map of the respective color combinations for the aggregate barcode), and the mapped values in the respective colorant image planes represent the relative amounts of the narrow band colorant to be deposited in the rendered composite image (col. 5, line 66 - col. 6, line 35; col. 8, lines 24-40, The printer prints the color components according to the controller instructions).

Regarding claim 7, Chew discloses the composite image is rendered as pattern of deposited narrow band colorants (col. 6, lines 10-35), each of which narrow band colorants exhibiting a predefined spectral reflectance characteristic (col. 4, line 64 - col. 5, line 39).

Regarding claim 8, Chew discloses the selected narrow band colorant exhibits a predefined narrow band absorption characteristic (col. 4, line 64 - col. 5, line 39).

Regarding claim 9, Chew discloses the selected narrow band colorant is selected from the group of cyan, magenta, and yellow colorants (col. 5, lines 62-65).

For claim 10, Chew discloses that the narrowband illuminant is selected from the group of red, green and blue illuminants (see figure 2 and column 8 lines 14-16).

Regarding claim 11, Chew discloses the rendered composite image is rendered using a digital color electrophotographic printer (col. 5, line 50-51; col. 5, line 62 - col. 6, line 9, Chew teaches the aggregate barcode (composite image) is printed using a color printer).

For claim 12, Chew discloses a spectral multiplexer for receiving image data representative of plural source images and for processing the image data to encode the source images in a composite image (col. 5, lines 40-59, Chew teaches an encoder and print controller for generating a aggregate barcode (composite image) from three constituent barcodes (source images)), wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image and for providing a composite image data signal (col. 5, lines 10-28; col. 6, lines 26-28, Chew teaches using black ink rather than merely combining the primary colors for printing); an image rendering device which is responsive to the spectral multiplexer for receiving the composite image data signal and for rendering the composite image on a substrate (col. 5, line 66-col. 6, line 9, Chew teaches a color printer for printing (rendering) the aggregate barcode (composite image)); and a demultiplexer for subjecting the rendered composite image on the substrate to illumination by a narrowband illuminant having a selected spectral power distribution (col. 6, line 37 - col. 8, line 10; col. 8, line 1-18, Chew teaches a scanner using optical filters or illuminating the image with red, green and blue lights to resolve the aggregate barcode into the constituent barcodes), such that at least one the encoded source images is made detectable (col. 6, line 37-co1.8, line 10, Chew teaches obtaining each of the constituent barcodes from the aggregate barcode). Bares teaches that black is an illuminant-neutral GCR.

Regarding claim 13, Chew discloses a system for spectral multiplexing of plural source images (col. 3, lines 14-27), comprising a spectral multiplexer for receiving

image data representative of a plurality of source images and for processing the image data to encode the plurality of source images into a composite image data signal (col. 5, lines 40-59; col. 5, line 66 - col. 6, line 9; col. 8, lines 24-33, Chew teaches an encoder and print controller for generating a aggregate barcode (composite image) from three constituent barcodes (source images). An image data signal is inherent to the print controller instructing the printer to print the aggregate barcode), wherein illuminant-neutral GCR is employed to alter the composition of one or more source images encoded for rendering as a composite image (col. 5, lines 10-28; col. 6, lines 26-28, Chew teaches using black ink rather than merely combining the primary colors for printing.) and wherein values representative of each source image pixel are mapped to a corresponding pixel value in a respective colorant plane (col. 5, line 66 - col. 6, line 28; col. 8, lines 24-40, Chew teaches a control means instructing the printer where to print the respective colorants for each constituent barcode and producing a map of the respective color combinations). Bares teaches that black is an illuminant neutral GCR.

Regarding claim 14, arguments analogous to those presented above for claim 4 are applicable to claim 14.

Regarding claim 15, Chew discloses a system for rendering a composite image (col. 3, lines 14-27), comprising an image recording device for receiving the composite image in the form of a composite image data file and for rendering the corresponding composite image as a rendered composite image in a plurality of narrow band colorants on a substrate (col. 5, line 62 - col. 6, line 9, Chew teaches a color printer receiving instructions from the print control means and printing the aggregate barcode (composite

image) on a paper substrate using cyan, magenta and yellow. A composite image data file is inherent to the print control means instructing the printer to print the colorants in the correct locations on the substrate).

Regarding claim 16, Chew discloses the image recording devices is provided in the form of a printer for printing the composite image on a substrate (col. 5, line 50-51; col. 5, line 62 - col. 6, line 9, Chew teaches the aggregate barcode (composite image) is printed using a color printer).

Regarding claim 17, Chew discloses the printer includes narrow band colorants selected for their apparent darkness when exposed to at least one of red, green and blue illuminants (col. 4, lines 64 - col. 5, line 45; col. 8, lines 14-16, Chew teaches the invention implements the CMY color model for generating the aggregate barcode and the RGB color model for resolving the aggregate barcode into the three constituent barcodes).

Regarding claim 18, Chew discloses a system for spectral demultiplexing of a rendered composite image having encoded therein a plurality of source images (col. 3, lines 14-27; col. 6, line 37- col. 8, line 10; col. 8, line 1-18, Chew teaches a decoder to resolve the aggregate barcode (composite image) into the constituent barcodes (source images)) wherein illuminant neutral GCR is employed to alter the composition of one or more source images encoded for rendering as a composite image (col. 5, lines 10- 28; col. 6, lines 26-28, Chew teaches using black ink rather than merely combining the primary colors for printing), comprising a demultiplexer for subjecting the rendered composite image to illumination by an illuminant having a selected spectral power

distribution (col. 6, line 37 - col. 8, line 10; col. 8, line 1-18, Chew teaches a scanner using optical filters or illuminating the image with red, green and blue lights to resolve the aggregate barcode into the constituent barcodes), such that at least one of the encoded source images is made distinguishable (col. 6, line 37-col. 8, line 10, Chew teaches obtaining each of the constituent barcodes from the aggregate barcode). Bares discloses that black is an illuminant neutral GCR.

Regarding claim 19, Chew discloses the composite image is formed from colorants selected-from the group of cyan, magenta, and yellow colorants (col. 5, lines 62-65), and wherein the demultiplexer further comprises a controller and an illuminant source responsive to control by illuminant source control signals provided by the controller (col. 6, lines 37-63; col. 8, lines 11-23, Chew teaches a filter changing means to change the optical filters or strobing the illuminant sources sequentially. A controller and control signals are inherent to controlling the filter changing mechanism or the strobing of the separate red, green and blue lights), and wherein the narrow band illuminant is selected from the group of red, green and blue illuminants (col. 8, lines 11-23).

For claim 20, Chew discloses a computer (4) for generating illuminant source control signals, wherein the illuminant source comprises a crt display for generating a narrowband illuminant (24, 26, 28), as shown in figure 2.

For claim 21, Chew discloses encoding the plurality of source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite

image, and wherein a gray component replacement fraction in the illuminant-neutral GCR is spatially modulated, so as to increase confusion; rendering the composite image on a substrate by use of a plurality of colorants; and recovering at least one of the encoded source images from the rendered composite image, such that the recovered source image is made distinguishable, by subjecting the rendered composite image to a narrow-band illuminant that is selected to reveal the source image, as shown in figure 2. Bares discloses that black is an illuminant neutral GCR.

For claim 22, Chew discloses encoding the plurality of source images in a composite image, wherein illuminant-neutral GCR is employed to alter to the composition of one or more source images encoded for rendering as a composite image, and wherein a gray component replacement fraction in the illuminant-neutral GCR is implemented to encode an additional, low-resolution source image intended for recovery under illumination by a multiband illuminant; rendering the composite image on a substrate by use of a plurality of colorants; and recovering at least one of the encoded source images from the rendered composite image, such that the recovered source image is made distinguishable, by subjecting the rendered composite image to at least one of: (a) a multiband illuminant and (b) a narrowband illuminant that is selected to reveal the source image, as shown in figure 2. Bares discloses that black is an illuminant neutral GCR.

For claim 23, Chew discloses a spectral multiplexer for receiving image data representative of plural source images and for processing the image data to encode the source images in a composite image, wherein illuminant-neutral GCR is employed to

alter to the composition of one or more source images encoded for rendering as a composite image and for providing a composite image data signal; an image rendering device which is responsive to the spectral multiplexer for receiving the composite image data signal and for rendering the composite image on a substrate; and a spectral demultiplexer for subjecting the rendered composite image on the substrate to illumination by an illuminant having a predefined spectral power distribution for which at least one of the first and second source images was encoded, such that a recovered source image derived from the encoded source image is recovered when the rendered composite image is subjected to the illuminant as shown in figure 2. Bares discloses that black is an illuminant neutral GCR.

For claim 24, Chew discloses that the spectral multiplexer is operable for mapping values representative of each source image pixel to a corresponding pixel value in a respective colorant image plane as shown in figure 2.

For claim 25, Chew discloses that the mapped values are determined according to at least one of the following: (a) the trichromacy of human visual response to colorant/illuminant interaction; (b) the spectral characteristics of the colorants selected for rendering the composite image, and (c) the spectral characteristics of the narrow-band illuminant(s) used for recovering the source image (col. 4, lines 64 - col. 5, line 45, Chew teaches the invention implements the CMY color model for generating the aggregate barcode and the RGB color model for resolving the aggregate barcode into the three constituent barcodes).

For claim 26, Chew discloses the spectral multiplexer is operable for spectrally encoding a polychromatic source image by mapping pixel values representative of plural separation images to a corresponding pixel value in one or more of a plurality of colorant image planes as shown in figure 6.

For claim 27, Chew discloses the separation images define the polychromatic source image according to the separation image planes, and wherein the composite image is defined in a spectrally multiplexed (SM) image plane having patterns of pixels, whereby at each location in the SM image plane, a pixel value representing one or more spectral components may be present, and wherein the pixel value patterns are determined according to the gray level of the corresponding pixels in one or more of the separation image planes as shown in Figure 6.

For claim 28, Chew discloses that the spectral multiplexer is operable for is spectrally multiplexing to the SM image plane wherein certain pixels includes color values representative of color separation image data from more than one source image plane as shown in Figure 2.

For claim 29, Chew discloses that the spectral multiplexer is operable for converting the polychromatic source image to an array of respective monochromatic separation images, each of which being mapped to a corresponding colorant image plane in the composite image, and the plurality of separation images being mapped to a corresponding plurality of colorant image planes in the composite image, as shown in Figures 2 and 6.

For claim 30, Chew discloses that the spectral multiplexer is operable for assigning each colorant to a respective colorant image plane of the composite image, and the colorant values in the respective colorant image planes represent the relative amounts of colorant to be deposited in the rendered composite image as shown in Figures 3 and 4.

For claim 32, Chew discloses the spectral demultiplexer is operable for subjecting the rendered composite image to an incident light spectrum having a selected spectral power distribution in at least two of three selectable bands of radiant energy as shown by the red, green, and blue lights of figure 2.

For claim 33, Chew discloses the spectral demultiplexer includes a controller and an illuminant source responsive to illuminant source control signals provided by the controller, and wherein the illuminant source includes one or more light sources for providing desired spectral power distributions in plural selectable bands of radiant energy as shown by the red, green, and blue lights of figure 2.

For claim 34, Chew discloses the selectable bands correspond to the long, medium, and short (LMS) wavelength bands of the light spectrum.

For claim 35, Chew discloses the image rendering device employs at least one selected colorant selected for its narrowband absorbing properties so as to appear dark when subjected to a first illuminant having a spectral power distribution that lies substantially within the spectral absorption band of the selected colorant, and to appear light when subjected to a second, differing illuminant having a spectral power

distribution that lies substantially outside of the spectral absorption band of the selected colorant, as shown in figure 2.

For claim 41, Chew discloses the image recording device is provided in the form of a printer for printing the composite image on a substrate as shown in Figure 6.

For claim 42, Chew discloses the printer includes one or more of cyan, magenta, yellow, and black colorants selected for their apparent darkness when exposed to complementary illuminants as shown in figure 2.

For claim 44, Chew discloses a gray component replacement fraction in the illuminant-neutral GCR is implemented to encode one of the first and second source images intended for recovery under illumination by a multiband illuminant; and wherein the spectral demultiplexer is operable for subjecting the rendered composite image to at least one of: (a) a first illuminant that is selected to reveal a selected one of the first and second source images and (b) a second illuminant that is selected to reveal the remaining one of the first and second source images as shown in figure 2. Bares discloses that black is an illuminant neutral GCR.

For claim 45, Chew discloses the first illuminant is a narrowband illuminant and the second illuminant is at least one of a multiband illuminant and a wideband illuminant as shown in figure 2.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrey S. Smith whose telephone number is 571 270-1235. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marvin Lateef can be reached on 571 270-1245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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JSS
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